

REMARKS

In the last Office Action, claims 1-6 were rejected under 35 U.S.C. §102(e) as being anticipated by Stewart et al. ("Stewart") (US 2004/0151991 A1). Claims 1-6 were further rejected under 35 U.S.C. §103(a) as being unpatentable over Neary (U.S. Patent No. 5,882,823) or Yang (U.S. Patent No. 6,096,459) in view of Stewart or Kanamitsu et al. ("Kanamitsu") (US 2003/0215722 A1). Claims 7-9 were withdrawn from further consideration as being directed to a non-elected invention.

The Examiner indicated acceptance of the drawings filed with the application. The Examiner also acknowledged applicants' claim for foreign priority under 35 U.S.C. §119 and noted that the priority document has not yet been received.

In accordance with this response, original claims 1-9 have been canceled and replaced by new claims 10-26. The specification has been revised in editorial respects and to include reference characters shown in the drawings and to provide a direct antecedent basis for the claim language.

Applicants respectfully request reconsideration of their application in view of the foregoing amendments and the following discussion.

The present invention pertains to a mask correction method that is performed using a composite charged particle

beam device of the type shown, for example, in Fig. 1, for correcting redundant defects in masks. In accordance with the inventive method, an electron beam produced by an electron beam lens barrel is scanned over a mask having a redundant defect to acquire an image of the mask, and the position of the redundant defect is then identified from the image. Coarse correction of the redundant defect is carried out by etching using a focused ion beam produced by a focused ion beam lens barrel, and then finishing correction is carried out by etching using an electron beam produced by the electron beam lens barrel. In accordance with the inventive method, the same electron beam lens barrel is used to produce an electron beam that is scanned over the mask to produce an image of the mask as well as to produce an electron beam to perform finishing correction by etching.

Newly added independent claims 10 and 21 define the inventive method as described above, and is not seen where the combined teachings of the prior art would have rendered the claims obvious to one of ordinary skill in the art.

The reference to Stewart discloses using a focused ion beam comprised of gallium ions for repairing a mask defect and then using an electron beam to remove gallium staining of the mask. By comparison, as shown in Figs. 2A-2B of the application drawings, in one embodiment of the present invention, coarse correction of a redundant defect 21 is

carried out by etching using a focused ion beam, which leaves a residual part of the defect, and then finishing correction is carried out by etching using an electron beam to complete the correction process. This is different from the removal of gallium staining by use of an electron beam as disclosed by Stewart.

Independent claim 17 recites a mask correction method comprising the steps of carrying out coarse correction by etching using a focused ion beam to remove a part of a redundant defect in a mask so as to leave a residual part of the redundant defect, and carrying out finishing correction by etching using an electron beam to remove the residual part of the redundant defect. As noted above, Stewart does not disclose this method, but rather discloses complete removal of the opaque defect by etching using a focused ion beam and then using an electron beam to remove implanted gallium ions that stained the mask as a result of the etching by the focused ion beam.

The reference to Neary discloses a method of repairing a defect by shining a focused ion beam on a substrate to remove a portion of the defect and to leave a residual thin wall of the defect, and then removing the residual thin wall of the defect by a process different from the step of shining a focused ion beam, such as an isotropic etching step. Neary does not disclose carrying out coarse

correction of a redundant defect by etching using a focused ion beam and then carrying out finishing correction of the coarsely corrected redundant defect by etching using an electron beam.

The reference to Yang discloses a method of removing bump defects on a mask by directing a high energy focused ion beam at the bump defect to implant ions into the entirety of the bump defect, and then etching the implanted bump defect with a basic solution to remove the bump defect. As described at column 3, line 44 through column 4, line 17, the bump defect 30 is irradiated with a focused ion beam of gallium ions to obtain thorough gallium staining of the bump defect, and then the stained bump defect is removed by exposing it to an aqueous solution of a strong base. Yang does not disclose carrying out coarse correction of the bump defect by etching using a focused ion beam, and then carrying out finishing correction of the redundant defect by etching using an electron beam.

The reference to Kanamitsu discloses a mask correction method comprising identifying the position of a defective portion to be processed on the mask by use of an electron beam, and then processing the defective portion by a shaped electron beam. Kanamitsu does not disclose carrying out coarse correction of the defect by etching using a focused ion beam, and then carrying out finishing correction of the

defect by etching using an electron beam. Furthermore, Kanamitsu has a U.S. filing date of December 23, 2002, which is later than applicants' priority date of November 27, 2002 based on Japanese priority Application No. 2002-344140. Thus upon the filing of a certified copy of the Japanese priority application and an English translation thereof, Kanamitsu will be removed as a reference.

As neither Neary or Yang discloses coarse correction of a defect by etching using a focused ion beam followed by finishing correction of the defect by etching using an electron beam in a composite charged particle beam device, it is not seen how either reference could be modified in view of Stewart or Kanamitsu to arrive at the presently claimed invention. Only Stewart discloses a composite charged particle beam device, though this is used to remove gallium staining after processing a defect with a focused ion beam of gallium ions. Thus the teachings of the prior art contain no motivation or suggestion for modifying the Neary or Yang methods to arrive at the presently claimed method.

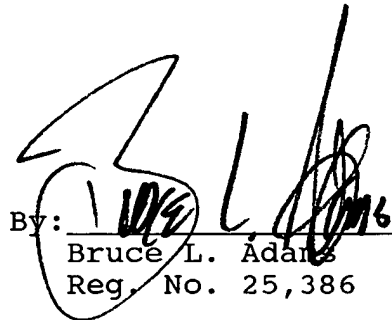
Moreover, none of the references discloses detecting secondary ions generated during coarse correction of a redundant defect and, when the type of detected secondary ions changes, terminating the coarse correction (as recited in claims 15 and 25) and automatically switching to finishing

correction to repair damage to the mask that occurred during coarse correction (as recited in claims 16 and 26).

In light of the foregoing, the application is now believed to be in allowable form. Accordingly, favorable reconsideration and passage of the application to issue are respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: 
Bruce L. Adams
Reg. No. 25,386

17 Battery Place
Suite 1231
New York, NY 10004
(212) 809-3700

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Debra Buonincontri
Name

Debra Buonincontri
Signature

March 23, 2006
Date